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(54) Repositionable wall covering.

(57) The invention relates to pressure sensitive adhesive wallpaper which can be easily repositioned during initial contact with the surface of a wall. Once a final desired position is attained, the wallcovering of the present invention is caused to permanently adhere to the wall by the application of increased pressure to the decorative surface of the wallpaper.

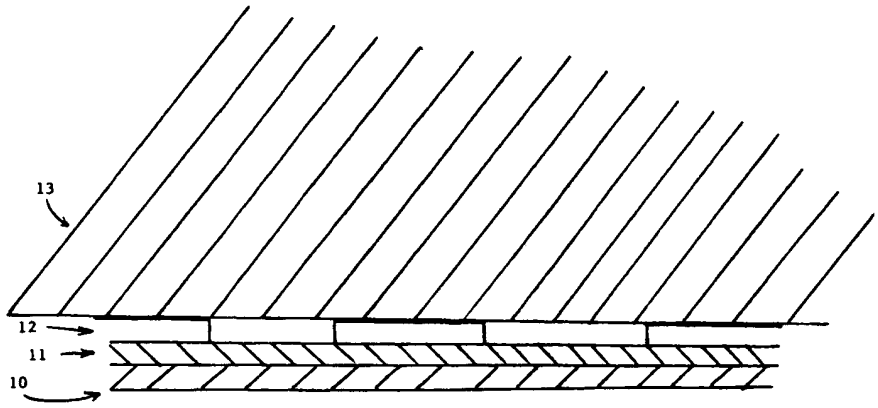

FIGURE 2

10 - printed substrate
11 - PSA
12 - separation means
13 - wall

Product of the invention in contact with the wall while still repositionable due to separation of the PSA from the wall.

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Field of the Invention

The invention relates to wall coverings, such as wallpaper or borders, which utilize a pressure sensitive adhesive and a means to minimize initial adhesion of the wall covering to a wall. Maximum adhesion is subsequently attained after the wall covering has been repositioned as desired.

Background of the Invention

Wall coverings are formed typically of paper or plastic material having a pattern or design printed or embossed on one surface, with the other surface, or backing, being coated by the consumer with a suitable adhesive, such as glue, cement, or the like (typically known as "wallpaper paste") by which the wall covering may be secured to a wall, ceiling or other surface. However, consumers dislike the inconvenience of mixing and applying the paste. Other types of wall coverings are formed of fabric, such as cotton, polyester and cotton, a polyester blend, or the like, having a design or pattern formed on what is typically referred to as the front or printed surface and whose rear surface is adapted to be coated by the user with the aforementioned adhesive in order to secure the wall covering to a surface.

Generally, in conventional wall coverings, once the wall covering is applied to the surface, it may be shifted or adjusted thereon to only a very limited degree until the adhesive paste cures, or dries. Thereafter, it is difficult, if not impossible, to remove the wall covering from the surface without the use of additional tools or artificial means. For example, it is known to "steam" the aforementioned types of wall coverings to remove them from the surface to which they adhere. Also, chemicals are available to "strip" the wall covering from that surface. Finally, mechanical scraping tools may be used to remove the wall covering. Unfortunately, even when extreme care is utilized, portions of the wall covering, such as its "backing", nevertheless may remain secured to the surface from which the wall covering is to be removed. Repositioning of the wall covering to match patterns is, at best, very difficult, and with most wallpaper adhesives, almost impossible.

Pressure sensitive adhesives, hereinafter "PSA" or "PSAs" are well known in the adhesives industry. These materials are known generally for their ability to provide adhesion between two substrates upon contact and some minimum level of pressure. PSAs can be adhered to a surface and yet can be stripped from the surface without transferring more than trace quantities of adhesive to the surface, and can then be re-adhered to the same or another surface because the adhesive retains some or all of its tack and adhesive strength. PSAs rely on high initial tack and/or quick set-up reaction, or cure time for prompt or instant adhesion. However, PSAs with sufficiently high tack to hold a wall covering in place are very difficult to apply to a wall and then reposition, as occurs for example, while matching up patterns from one wallpaper strip to the next. Although suitable pressure-sensitive adhesives have in the past been applied to wall coverings, attempts to reposition those same wall coverings (i.e. wall coverings made of paper, cotton, flannel, or the like) generally have not met with success. Typically, wall coverings having self-adhesive backings have fallen from the walls to which they were applied shortly after such application.

UK Patent Application GB 2,171,956A published September 10, 1986 for inventor Rothenberg, teaches a self-adhesive wall covering which is easily removable from a wall, consisting essentially of fabric, a barrier paper, a PSA, and a release paper.

UK Patent Application GB 2,117,271A published October 13, 1983 for Gibson, teaches a wall covering with a PSA backing.

US Patent 3,663,269, issued May 16, 1972 to Fischer, et al., teaches a wall covering having a coating of dry, encapsulated adhesive on the back surface which is made tacky by the application of heat or pressure.

US Patent 4,783,354, issued November 8, 1988 to Fagan, teaches a modified PSA for an adherable, yet removable sheet material. The invention relates to the use of a wax-in-water emulsion and a PSA emulsion in a specific ratio.

US Patent 4,555,441, issued November 26, 1985 to Rothenberg, teaches a self-adhesive fabric type wall covering consisting essentially of fabric, acrylic-saturated paper, a PVA adhesive, and a layer of release paper removably secured to the PVA adhesive.

US Patent 4,828,881, issued May 9, 1989 to Brown, et al., teaches a sheet substrate coated on one side with a PSA and coated with a curable and foamable material on the other side. The foamable material creates a textured visual appearance and does not interfere with or impact the PSA's adhesion to the wall, nor the repositionability of the sheet substrate.

US Patent 4,650,704, issued March 17, 1987 to Rothenberg, teaches a self adhesive wall covering with a barrier paper and a PSA.

Japanese Patent No. 61-115981, published June 6, 1986, Fukagawa, teaches the use of hollow protrusions containing a PSA on the back of wall paper. The hollow protrusions rupture with pressure releasing the adhesive.

It is desirable to provide a fabric-type, plastic-type or paper-type wall covering that is manufactured with a suitable adhesive backing, thus resulting in a so-called self-adhesive or PSA wall covering that may be applied to a surface and yet repositioned, and which does not require the use of additional cement, glue or wallpaper paste. It is also desirable to provide such a wall covering that self-adheres to a surface upon contact or slight initial pressure, yet which can be easily repositioned before and until a final desired position is achieved. It is readily appreciated that a self-adhesive wall covering avoids the task and mess associated with conventional wall coverings that require application thereto of cement, glue or wallpaper paste by the user in order to apply, or "hang", that wall covering.

OBJECTS OF THE INVENTION

Therefore, it is an object of the present invention to provide a repositionable PSA wall covering or the like that avoids the disadvantages and defects of the prior art.

Another object of the present invention is to provide a laminated self-adhesive wall covering comprising a fabric, plastic film, or paper substrate, possessing a decorative printed or embossed front side and a back side, a PSA applied to said back side, and a separation means for partially and temporarily maintaining a separation between the PSA and the wall or other substrate to be covered, while the separation means contacts, and is moved along, the wall or substrate.

A further object of this invention is to provide a PSA-backed paper-, plastic- or fabric-type wall covering that is easily adjustable on and removable from a surface, such as a wall.

Various other objects, advantages, and features of this invention will be readily apparent from the following detailed description and appended claims.

SUMMARY OF THE INVENTION

In accordance with this invention, a PSA-backed wall covering is provided, possessing a fabric, paper, or plastic substrate printed or decorated on one side and coated on the other side with a PSA, and also possessing a separation means between the PSA and the wall to be contacted, whereby the wall covering can be initially repositioned by sliding the surface of the separation means across the wall surface until a desired location is achieved. Then by applying sufficient pressure to the outer, decorated surface of the printed substrate, the separation created by the separation means between the PSA and the wall is overcome and the PSA contacts and adheres to the wall. Thus, a wall covering is provided which can slide freely against the surface of the wall and which develops tack after pressure is applied. By "wall" herein is meant a wall or partition as in a room or on the inside or outside of a building. However, "wall" shall also mean herein any solid surface which can receive a PSA-backed covering, including and not by way of limitation, cabinets, doors, floors, ceilings, shelves, signs, fences, billboards, automotive vehicle siding, windows, stationary or movable paneling.

Thus, the present invention is directed to a self-adhesive wall covering that is easily repositioned after initial contact with a wall, comprising:

a substrate having a printed embossed or otherwise decorated front side and a back side;

a pressure sensitive adhesive composition coated onto said back side of said substrate;

a separation means, optionally removable, secured to said pressure sensitive adhesive or to the backside of said substrate, wherein said separation means temporarily reduces or eliminates the contact surface area between said adhesive and the wall.

The products of this invention fulfill the need for eliminating wet wall cover materials which are inconvenient to handle by the general public.

BRIEF DESCRIPTION OF THE DRAWINGS

The following detailed description, given by way of example and not intended to limit the present invention, will be better understood in conjunction with the following drawings in which:

FIG. 1 is a cross section view of one embodiment of the present invention including a printed substrate 10, a PSA 11 and a separation means 12.

FIG. 2 is a cross section view of one embodiment of the present invention including a printed substrate 10, a PSA 11, and a separation means 12, which is in contact with a wall 13.

FIG. 3 is a cross section view of one embodiment of the present invention, wherein the printed substrate 10 has been pressed to force the PSA 11 through openings in the separation means 12 so that the PSA 11 contacts the wall 13.

FIG. 4 is a three-quarter perspective view illustrating the printed substrate 10, the PSA 11 and a perforated separation means 12, through which the PSA 11 is visible.

FIG. 5 is a cross section view of another embodiment of the present invention including a printed substrate 10, a separation means 22 and a PSA 11.

FIG. 6 is a cross section view of another embodiment of the present invention including a combined printed substrate with separation means 32 and PSA 11.

PIG. 7 is a perspective view of a printed substrate 10 with a PSA 11 coated on the substrate's backside and a netting-type separation means 42 embedded onto the surface of the PSA 11.

DETAILED DESCRIPTION OF THE INVENTION

The invention comprises a decorated, printed or embossed substrate 10 of fabric, plastic film, such as vinyl, (i.e., polyvinyl chloride), or polyester, cellulosic material, such as but not limited to paper, to which has been applied on the backside or non-printed side a PSA, either as a uniform coating or in a desired pattern. According to the present invention, various embodiments allow the initial and temporary separation of the PSA 11 from a wall or other substrate while and until final positioning is completed.

Printed Substrate

The printed or embossed substrate 10 can be, without limitation, any natural or synthetic cloth fabric, plastic, paper, or paper-like material, copolymer, laminate or the like or combination thereof, which can be manufactured in a layer, sheet, web or film and printed upon, embossed, or otherwise decorated on at least one surface. This can include, for example, wallcoverings, billboard advertisings, home and commercial decorations, and the like. There is no limitation on the thickness of the printed substrate 10. By "printed substrate" herein is meant any layer, film, web, or sheet of material which bears a design, color, or texture which is acceptable as a wall covering product. Thus, for example, pictures, patterns, solid colors, and textured embossings on vinyl film, cloth fabric, paper or other pressed cellulose material, acrylate or acetate film, polyester or Mylar, polyethylene, polypropylene, polyamides, polycarbonates, neoprene, nitrile butyl rubber, polysulfide, chloroprene rubber, isoprene rubber, and the like, and laminates thereof, are also within the term "printed substrate." The printed substrate 10 can be produced by any manufacturing technique known to those skilled in the art, including and not by way of limitation, extruding, co-extruding, molding and blown molding, sheeting, rolling, stamping, laminating, and the like.

The preferred printed substrate 10 is sufficiently colored, patterned, printed or embossed as to be at least opaque and preferably not transmissive so that neither the separation means beneath, nor any holes therein, is visible through the printed substrate 10. Particularly preferred substrates are paper, embossed paper, and vinyl film.

The PSA

The PSA 11 useful in the present invention can be any adhesive known to those in the industry provided it exhibits sufficient initial tackiness or a cure rate sufficient to cause the printed substrate 10 to adhere to the wall. Adhesives are commonly classified into thermosetting, thermoplastic, elastomeric, and alloys. Thermosetting adhesives are materials that cannot be heated and softened repeatedly after the initial cure. Adhesives of this sort cure by chemical reaction at room or elevated temperatures, depending on the type of adhesive. Multiple-part thermosetting adhesives often have longer shelf lives and cure more rapidly than do single-part adhesives, but can require metering and mixing and have a limited working life. Because molecules of thermosetting resins are densely cross-linked, their resistance to heat and solvents is good, and they show little elastic deformation under load at elevated temperatures. While operative herein, thermosetting PSAs are less desired in the present invention, particularly if in multipart form.

Thermoplastic adhesives do not crosslink during cure, so they can be resoftened with heat. They are single-component systems that harden upon cooling from a melt or by evaporation of a solvent or water vehicle. Holt melt adhesives and wood glues are examples of thermoplastic adhesives, the latter being emulsions which harden upon the evaporation of water. While operative herein, thermoplastic PSAs are less desired in the present invention, particularly if pre-heating or post-evaporation is required.

Elastomeric-type adhesives are based on synthetic or naturally occurring polymers having great toughness and elongation. These adhesives may be supplied as solvent solutions, latex cements, dispersions, pressure-sensitive tapes, single or multiple-part solventless liquids or pastes. Elastomeric-type PSAs are preferred in the present invention over thermoplastic and thermosetting adhesives for convenience.

Adhesive alloys are made by combining thermosetting, thermoplastic, and elastomeric adhesives. Such combinations are also useful as the PSA 11 of the present invention.

Of the preferred elastomeric-type PSA, many chemical compositions are known to those skilled in the art and without limitation these are useful in the present invention. Thus, for example, elastomeric-type PSAs comprising natural rubber, reclaimed rubber, styrene-isoprene-styrene rubber,

butadiene-acrylonitrile rubber, polyvinyl ether rubber, styrene-butadiene-styrene rubber, butyl rubber, polyisobutylene rubber, nitrile rubber, styrene-butadiene rubber, polyurethane, polysulfide, polyesters, silicone resins and gums, neoprene rubber, acrylic, methacrylic, polyacrylate ester rubber, and vinyl and mixtures thereof are useful in the present invention.

Room temperature curing PSAs are predominantly based on the use of metal chelates to obtain cross-linking. Reaction with active carboxyls in the polymer backbone to form metal salt bridges occurs as the labile protective chelate group is driven out of the adhesive mass during the drying process. Adding diisocyanates to obtain reactive crosslinking is another useful method.

The key properties in characterizing PSAs involve dynamic forces measured as tack, shear, and peel strengths. Thus, a preferred PSA 11 has a desired balance between shear and peel, but without loss of tack. In general, as peel strength improves, shear strength tends to deteriorate, and vice versa. In the wall covering products of the present invention, sheer strength is of slightly less importance than peel strength. As discussed below, tack can be varied to achieve the desired aggressiveness by chemically altering the PSA.

Particularly preferred herein as PSAs are compositions comprising silicone, including copolymers comprised of vinylidene fluoride and/or tetrafluoroethylene with organopolysiloxane and an organohydrogenpolysiloxane. Silicone PSAs have good thermal resistance, cold resistance, chemical resistance, electrical insulating properties, and controllable tack and hence are used for extensive purposes.

Organic PSAs also have a variety of common uses and are generally lower cost than silicone PSAs. However, some organic PSAs are unsuitable for certain uses, such as PSA tapes, because the organic components do not weather well. Also certain organic PSAs have poor adhesion to low energy surfaces, such as silicone or teflon coated surfaces, surfaces coated with paints containing silicone or fluorocarbon additives, surfaces contaminated with oil, grease, etc., and many plastic substrates, such as films and the like. Silicone PSAs exhibit excellent adhesion to such low energy surfaces, have excellent weatherability, retain flexibility even at low temperatures, and are chemically stable at very high temperatures. Silicone PSAs based on alkenylterminated polydiorganosiloxanes are well known in the organosilicone art and their syntheses need no further delineation herein. Generally, an alkenyl-containing terminating reactant, such as divinyltetramethyldisiloxane, is equilibrated with a diorganosiloxane reactant, such as octamethylcyolotetrasiloxane, in the presence of an acidic or alkaline catalyst.

Preferred as organic PSAs herein are the acrylate adhesives, which are normally a copolymer of a higher alkyl acrylate, such as 2-ethyl hexyl acrylate, copolymerized with a small amount of a polar comonomer. Suitable comonomers include acrylic acid, acrylamide, maleic anhydride, diacetone acrylamide, and long chain alkyl acrylamide. Additional preferred organic PSAs include polyvinyl acetate, vinyl acetate copolymer including comonomers of acrylate and maleate or ethylene, and acrylics. Suitable pressure-sensitive acrylic adhesives are described in the public literature and are known to those skilled in the art.

Silicone cross-linking agents for optional use herein include the organic peroxides and alkoxy silanes. The use of either cross-linking agent will increase the cross-link density of the alkenyl-terminated polydiorganosiloxane adhesive and the shear strength of the adhesive composite. Suitable alkoxy silane cross-linking agents are well known in the art and cross-link the silicone PSA through a condensation reaction with Si-OH end groups. The preferred cross-linking agents are methoxy- and ethoxysilanes such as methyltrimethoxy silane, ethyl silicate, gamma-aminopropyltrimethoxy silane, triethoxy silane, etc. The alkoxy cross-linking agents require a cross-linking catalyst such as amines or carboxylic acid salts of metals including Pb, Zn, Zr, Sb, Fe, Cd, Sn, Ba, Ca, and Mn, particularly the naphthenates, octoates, hexoates, laurates, and acetates thereof. Tin (II) octoate and dibutyltin dilaurate are particularly satisfactory. Amine substituted cross-linking agents such as gamma-aminopropyltrimethoxy silane are self-catalyzing. The metal cross-linking catalyst should be present in amounts ranging from about 1 to about 1000 parts per one million parts by weight of PSA.

Suitable peroxide cross-linking agents include diaroyl peroxides, such as dibenzoyl peroxide, di-p-chlorobenzoyl peroxide, and bis-2, 4-dichlorobensoyl peroxide; dialkyl peroxides such as di-t-butyl peroxide and 2,5-dimethyl-2, 5-di-(tbutylperoxy)-hexane; diaralkyl peroxides such as dicumyl peroxide; alkyl aralkyl peroxides such as t-butyl cumyl peroxide, and 1,4-bis(t-butylperoxyisopropyl)-benzene; alkyl aroyl and alkyl acyl peroxide such as t-butyl perbenzoate, t-butyl peracetate, and t-butyl peroctoate; and other peroxides such as peroxy siloxanes and peroxy carbonates.

Of course, the PSA should not be cross-linked beyond the point where it is no longer tacky on the surface. Thus, persons skilled in the art must adjust the amount of cross-linking agent utilized, the heat of cure, the shear strength desired, and the resultant tack. Generally, from about 0.1 to about 3% by weight of peroxide based on the weight of PSA may be used.

The silicone adhesive and/or organic adhesive composite may be applied to the printed substrate 10 from solution, emulsion or solventless.

In the case of adhesive application to the back side of the printed substrate 10 from emulsion, an emulsifying agent or agents may be useful to maintain the adhesive in a substantially stable state of suspension. For use herein, the emulsion is preferably stable even at low water content so that drying of the adhesive coat may be accomplished prior to final assembly of the composite product.

Solution application of the PSA 11 composite to the printed substrate 10 requires only an amount of solvent that is capable of dissolving the adhesive. Such solvents are preferably nonpolar and include toluene, dimethyl ether, xylene, etc. Aromatic solvents are preferred. Aqueous emulsions of PSA without organic solvent are even more preferred herein. Typically, a solventless silicone PSA can be prepared with a viscosity of from 100 to 100,000 centipoise at 25° C. An organic solvent is typically used when the polydiorganosiloxane has a viscosity of at least one million centipoise, a so-called silicone gum.

The solvent should not have such a low vapor pressure that it is difficult to remove from the adhesive in a drying process. If the solvent is too difficult to remove then phase separation may occur following precipitation but prior to complete solvent removal.

Adhesive emulsions or solutions for application to a printed substrate 10 generally contain from about 10 to 400 parts by weight of adhesive solids, i.e. micelles of adhesive or solute, for each 100 parts by weight water or organic solvent. Preferably, the solids should range from about 15 to about 200 parts and more preferably from about 20 to about 100 parts by weight for each 100 parts by weight of water or organic solvent.

The adhesive emulsion or solution, once formed is simply applied to the back side of a printed substrate 10 and dried by known methods. As above, drying the emulsion should be performed as quickly as possible to minimize the time in which the emulsion may break and phase separate.

Following application and drying of the PSA 11, the adhesive can be cross-linked as needed. Where an alkoxysilane is utilized as the cross-linking agent, cross-linking will occur by simply exposing the composite to atmospheric moisture. Heating may be used to speed the cure. However, where a peroxide cross-linking agent is utilized, then a heat cure is often necessary. Thus, the composite must be exposed to temperatures ranging from about 80° to about 200° C., for times varying between about 5 minutes to about 1 hour. Persons skilled in the art are readily familiar with cross-linking these systems.

In a more preferred embodiment, the PSA 11 is high solids, with little or no water or solvent and is applied directly to the back side, particularly preferred herein as the PSA.

The adhesive may be applied to a variety of printed substrates according to the skill of the art. To manufacture a wall covering, the PSA composition, solution or emulsion is applied as a continuous layer or film, or in a pattern on the back side surface of a printed substrate including paper, vinyl, teflon, cellulosic material, polyester, etc., as discussed hereinabove.

The Separation Means

One important feature of the present invention is the ability to reposition the PSA-backed wall covering during initial application to the wall, followed by permanent anchoring to the wall in the desired location. This ability to reposition the product of the present invention is achieved by maintaining an initial space or separation between the PSA 11 on the back side of the printed substrate 10 and the eventual wall surface. Thus, the separation means of the present invention has a contacting surface which contacts the wall thereby minimizing or eliminating contact of the PSA with the wall. The separation is temporarily maintained in the present invention by an optionally removable or compressible separation means 14, which can be, in one embodiment, a film or liner made of plastic, paper, synthetic or natural fabric or the like which partially covers the PSA 11 in stripes, dots, a crosshatch, grid, web, or net-like pattern. In a particularly preferred embodiment, the separation means is a web or net of plastic material applied over the PSA, whereby the net or web contacts the wall surface predominantly to the exclusion of the PSA. Figure 7 illustrates a printed substrate 10 and PSA 11 applied to the backside of the printed substrate 10. A plastic net separation means 42 is applied over and embedded into the PSA 11. This product was prepared using Internet No. ON-0141, 20 mils polyolefin mesh applied onto 2-3 mils of a PSA Covinax 271, from Franklin International. The product had good slidability during initial wall contact. In another, and preferred, embodiment the separation means 14 is a paper liner possessing holes through which the PSA can subsequently provide tack sufficient to adhere the wall covering to the wall.

According to the present invention, the thickness of the separation means is sufficient to allow the PSA-backed wall covering to be moved while the separation means is in contact with the wall without the PSA 11 adhering to, or significantly contacting, the wall. During this period, the contact

surface area between the PSA 11 and the wall is reduced and preferably eliminated. When the desired location for the wall covering is attained, increased pressure on the printed or decorative front side of the wall covering causes slight deformation of the printed substrate 10 sufficient to cause the PSA 11 to contact the wall surface through the openings or pattern in the separation means 14 to thereby engage with, and adhere the wall covering to, the wall. It is desirable to have up to 30% of the surface area of the separation means 14 be open areas for exposure of the PSA 11, but this percentage is not a limitation herein. The percent of surface area of the separation means 14 which is available for allowing the PSA 11 to contact the wall can vary in relation to the aggressiveness of the PSA 11. This, in turn, can be varied as needed, based on the texture and surface chemistry of the wall, as well as the weight of the printed substrate 10, by changing the type or amount of the PSA 11 applied to the back of the printed substrate 10.

The size, location, pattern and surface area of the holes in the separation means 14 of this embodiment can also be varied according to the present invention to match or register, if desired, with the printed or embossed patterns on the printed substrate 10. In this manner, the detectability of the holes in the separation means 14 can be significantly reduced. The holes in the separation means 14 can be circles, as shown in FIG. 4, or diamond-shaped, square- or rectangular-shaped, or other shapes or patterns. The holes can be die cut, stamped, or the like into the separation means 14 using known cutting, trimming or stamping techniques, before the separation means 14 is applied over the PSA 11.

It is desirable to use a thin separation means to thereby minimize the deformation of the printed substrate 10 when it is pressed to engage the PSA 11 to the wall. The thicker the separation means is, the more noticeable is the deformation of the printed substrate 10 after final pressure is applied, said deformation appearing as dimples in the locations of the holes of the separation means. However, if the separation means is too thin, insufficient separation is provided to allow the wall covering to slide over the wall on the surface of the separation means without the PSA 11 contacting and adhering to the wall. Thus, it is preferred that the separation means be about 0.75 to 2.5 mil thick, more preferably 1.0 to 2.0 mil thick.

It is also preferred but not required that the separation means and the printed substrate 10 be similar in color to minimize "see through" of the separation means 14 through the printed substrate 10.

It is preferred but not required that the aforementioned separation means 14 be optionally removable in toto or in selected regions. Thus, as shown in FIG. 4, the separation means 14 is preferably a release liner which is perforated in at least one direction, and preferably two directions at selected distances. In this manner, the wall covering product can exhibit high adhesion where needed, as for example, in a corner or near an edge, by the selective removal of a section of the release liner separation means 14 to thereby expose more PSA 11. Likewise, the separation means 14 can be configured to leave exposed PSA 11 along one or both side edges, and/or both the top and bottom edges of a roll or sheet of the wall covering product. This can be achieved by cutting the separation means 14 to a desired size smaller than the width or length of the printed substrate 10.

In another embodiment of the present invention, the separation means 22 comprises small bumps or multiple projections, as shown in FIG. 5, which project up above the PSA 11 and provide non-adhesive contact points for sliding the product along the wall. When the desired position is attained, increased pressure on the printed surface 10 compresses or otherwise deforms the bumps or tops of the separation means 22. This causes the PSA 11 residing between the bumps or tips to contact the wall, thereby adhering the wall covering to the wall.

In a modification of this embodiment shown in FIG. 6, the separation means 32 is actually part of the back side of the printed substrate 10. Thus, a rough, bumpy, ribbed or peaked back side is present on, or topically applied to, the back of the printed or embossed substrate 10 wherein the roughness, bumps, ribs or peaks are of sufficient size to create therebetween troughs for retaining PSA 11. The PSA 11 can, for example, be applied to the rough back side of the printed substrate 10 then removed from the tips or peaks of the bumps by wiping. In yet another embodiment, the separation means is applied onto the PSA 11 as a row or ridge of compressible peaks, whereby the peaks of the separation means project up from the PSA 11 to provide initial contact with the wall.

In another embodiment of the present invention the PSA 11 is dusted or coated with a powder, such as talc, ground PVC, silica, teflon, wax, titania, polyolefin, starch, flour, glass beads and the like to thereby modify the aggressiveness of the PSA 11. In one embodiment, the PSA is completely covered with a dusting of a powder such as a prilled wax or expandable PVDC spheres, able to serve as a separation means. In another example of this embodiment, a dusted pattern of wax particles, expandable plastic beads, or glass beads is applied over the PSA 11, whereby the particles are of a

size sufficient to initially hold the PSA 11 away from the wall surface. The pattern of dusting can be achieved, for example, by using a covering mask bearing holes through which the dust can contact the PSA. This embodiment eliminates the need for a paper or fabric release liner, and provides for a light powdered topical coating which acts as a separation means between the PSA 11 and the wall, whereby the wall covering product can slide along the wall on the surface of the powder coating. When desired, increased pressure will dislodge the topical powder coating of the talc, silica, etc. thereby exposing the PSA 11 beneath to contact the wall.

In yet a different embodiment, the separation means is achieved by fiber flocking, an established technology that allows fibers of various length and bending modules to be placed upright on an adhesive coating at a desired density. The fibers are preferably of a synthetic material such as nylon, polyester and the like, but could also be natural fibers, such as wool or cellulosic. The preferred fiber length in this embodiment is a length sufficient to initially separate the PSA 11 beneath from the wall during repositioning of the wall covering. Such a length can be, for example, from one thousandth to 3 thousandths of an inch. The fibers remain vertical or predominantly vertical under modest pressure of repositioning without significantly contacting the PSA with the wall, but collapse under higher pressure from a hand, brush or rolling tool to thereby reveal the tacky PSA 11 beneath for contact with the wall.

In a slight variation, the fiber flocking separation means can be replaced with a low density deformable plastic foam. The foam may be placed over or in the PSA 11 in a continuous sheet, in spots, in strips, or in the form of flock. The deformable plastic foam can also be in the form of, but not necessarily limited to, scrim or netting and can be selected from any known foamable and deformable plastic.

An expandable or foamable particulate product, such as Expancel® from Nobel Industries can be incorporated into or applied topically onto the PSA 11 to provide a separation means. The expandable particles, initially 5-15 microns in size, expand on heating as a low boiling additive boils off. Expancel® contains isobutane and as this boils off the particles expand forming raised tips or bumps which can act as separation means in the present invention. The expanded tips or bumps are randomly distributed or can be set out in a pattern and can be applied pre-expanded to the surface of the PSA 11. Rigid or closed cell foams which do not deform are not desired in this embodiment. The deformable foamed particles should be thick enough to cover the PSA 11 but thin enough to allow the wall covering product to be rolled, and thin enough to be permanently deformable under higher pressure to expose the PSA 11. By "deformable" is meant low spring or poor memory so that the foam collapses under pressure and does not return to its initial size or shape. The deformable plastic foam can be selected from the group consisting of urethanes, polyvinylidene chloride, polyethylene, polypropylene, polystyrene, rubber latices (natural and synthetic), and polyvinyl chloride. The wall covering product of this embodiment will be able to slide along a wall as the foam contacts the wall surface, and without significantly contacting the adhesive composition with the wall and yet can be permanently adhered by the application of sufficient pressure to deform the foam and thereby expose the PSA 11.

In a slight variation of the deformable plastic foam separation means, a friable or brittle material is used to cover the PSA 11. This friable or brittle separation means 12 crumbles into particulates upon the application of pressure, and these particulates become submerged in the PSA 11 to reveal its tackiness and adhesive function. The friable or brittle separation means can be deposited as a separate layer over the PSA 11. Alternatively, the PSA 11 may contain an immiscible component, such as wax, which floats or migrates to the surface of the PSA 11 during or immediately after its application to the printed substrate 10. During the period immediately following this application, such as during a dry or curing, if any, of the PSA 11, the immiscible component forms a friable or brittle separation means top coating on the PSA 11. This friable or brittle separation means may be disrupted and submerged in the PSA 11 upon the application of sufficient pressure. Such a friable or brittle material could be silicates, polystyrene, and other relatively low molecular weight materials which float on or are immiscible with the PSA 11.

In another embodiment, the separation means comprises a corrugated material or substrate on which has been coated with stripes or other patterns of PSA 11 in the areas which form the troughs or valleys of the corrugated substrate. In this manner, the PSA 11 is temporarily hidden or protected from contacting the wall by the peaks of the corrugation until pressure is applied to compress the corrugation. Thus, during positioning of the wall covering, the product slides freely on the uncoated ridges serving as the separation means.

To further demonstrate and explain the present invention, and not by way of limitation, the following examples are presented.

Example 1

Printed and embossed paper substrate, 70 pounds per ream, measuring 20.5 inches across was coated by means of gravure with an acrylic PSA (C800) obtained from Century Adhesive, Columbus, Ohio. To the PSA coating was applied a separation means consisting of a paper liner, 2.0 mil thickness, possessing one-quarter inch circular holes spaced approximately every one-half inch. The resulting wall covering was contacted with the wall and allowed to slide across the wall surface on the separation means. Then pressure from a person's hand or a roller tool was used to press the PSA into contacting the wall through the holes in the separation means. In this manner the wall covering product was easily secured to the wall.

Example 2

A PSA (Morstik 125, from Morton) was applied by standard nip technique to the non-printed side of a paper. Onto the PSA coating was applied Expancel® 551 DU polyvinylidene chloride in a uniform solvent dispersion at 30% solids to achieve a 1.5% by weight particle addition. The coated substrate was then heat treated at 93° C for seven minutes to drive out the hydrocarbon in the particles and thereby expand them to about 50 microns. The expanded particles protruded above the surface of the PSA sufficiently to contact a wall surface and temporarily shield the PSA from contact. After repositioning the wall covering on the wall by sliding it in several directions, increased hand pressure applied to the printed side of the wall covering engaged the PSA to the wall.

Example 3

A PSA (C800) obtained from Century Adhesive, Columbus, Ohio, was applied to the backside of a standard vinyl coated paper stock (Aanekoski, CT222K) at about 0.80 to 1.0 mil thickness. The coated paper was put through a brief heat cycle to drive off the water solvent. Then a mask paper containing 1/4 inch holes every 1/2 inch was applied over the PSA and powdered PVC was dusted onto the PSA through the holes in the mask. The papermask was then removed and the resulting product was able to contact a wall and slide along the surface of the dust. Then increased pressure allowed the non-coated PSA to contact and adhere to the wall.

Example 4

A PSA (Covinax 081) was coated onto paper at 2-3 mils thickness and then dusted with Vestowax Prills with particle size of 125 microns. The resulting wallcovering had excellent slidability, removability and initial tack with no visual detection of the separation means.

Example 5

A PSA (Covinax 271) was coated onto paper at 2-3 mils and then a mesh or net material (Internet No. ON-0141, 20 mils, Internet, Inc. Minneapolis, MN) was pressed into the PSA. In a similar example, a polyolefin netting was pressed into the Covinax 271 PSA. Both wallcovering products exhibited good to very good slidability, removability and repositioning although the polyolefin netting was detectable through the decorative face of the wallpaper.

Examples 6, 7,8

A PSA (Covinax 081) was coated onto paper at 2-3 mils and then dusted with a light coating of Sta-Mist starch 454, or corn bran, or teflon brand ground particles MP1200. The resulting wallcovering products exhibited high slidability, good removability, and excellent adhesion to the wall following increased pressure.

Example 9

A PSA (Covinax 081) was coated onto paper at 2-3 mils and then dusted with Crystal Fil "D" glass beads, average size of 85 microns. The slidability was good to excellent, no visible "see through" of the beads. The initial adhesive strength after 30 seconds was slightly higher than desirable, but this can be modified by using a less aggressive PSA.

Example 10

Covinax 271 PSA was applied at 3-5 mil thickness to a paper. Over the PSA was applied on open cell foam, Nonafoam® polyethylene foam, 10 mil thick x 0.8", obtained from NMC, Inc. The resulting wallcovering product had excellent slidability, acceptable removability and repositioning, minimal visual detection of foam spacer, and acceptable initial adhesive strength.

Claims

1. A self-adhesive wall covering that is easily repositioned after initial contact with a wall, comprising:
   a substrate having a decorative front side and a back side;
   a pressure sensitive adhesive composition applied onto said back side of said substrate; and

a separation means secured to or a part of the backside of said substrate, wherein said separation means temporarily reduces the contact surface area between the adhesive and the wall.

2. The wall covering of claim 1 wherein the substrate is selected from the group consisting of natural or synthetic cloth, plastic, paper, and pressed cellulosic material.

3. The wall covering of claim 1 wherein the substrate is selected from the group consisting of acrylate, acetate, polyester, Mylar, polyethylene, polypropylene, polyamides, polycarbonates, neoprene, nitrile butyl rubber, polysulfide, chloroprene rubber, isoprene rubber, and combinations thereof.

4. The wall covering of claim 1 wherein the pressure sensitive adhesive composition is selected from the group consisting of natural rubber, butyl rubber, polyisobutylene, nitrile, styrene-butadiene, polyurethane, polysulfide, polyesters, silicone, neoprene, and mixtures thereof.

5. The wall covering of claim 1 wherein the pressure sensitive adhesive composition is selected from the group consisting of polyvinyl acetate, vinyl acetate, alkyl acrylates, acrylics, methacrylics and methyl methacrylates.

6. The wall covering of claim 1 wherein the pressure sensitive adhesive composition is a silicone comprising an organopolysiloxane.

7. The wall covering of claim 1 wherein the pressure sensitive adhesive composition is a silicone comprising a polydiorganosiloxane.

8. The wall covering of claim 1 wherein the pressure sensitive adhesive composition is a silicone comprising an alkenylterminated polydiorganosiloxane.

9. The wall covering of claim 1 wherein the pressure sensitive adhesive composition comprises an acrylic composition.

10. The wall covering of claim 1 wherein the pressure sensitive adhesive composition comprises a polyvinyl acetate composition.

11. The wall covering of claim 1 wherein the separation means has openings through which the pressure sensitive adhesive composition is exposed for subsequent contact with the wall.

12. The wall covering of claim 1 wherein the separation means is selected from the group consisting of plastic film, paper, cloth, and synthetic fabric.

13. The wall covering of claim 1, wherein the separation means comprises multiple compressible projections which protrude from said back side of the substrate and through the pressure sensitive adhesive composition.

14. The wall covering of claim 13 wherein the projections comprise a deformable plastic foam.

15. The wall covering of claim 14 wherein the deformable plastic foam is selected from the group consisting of urethanes, polyvinylidene chloride, polyethylene, polypropylene, polystyrene, rubber latices (natural and synthetic), and polyvinyl chloride.

16. The wall covering of claim 1 wherein the separation means comprises powder selected from the group of materials consisting of talc, ground PVC, teflon, polyolefin, expandable PVDC spheres, silica, wax, titania, starch, glass beads and flour.

17. The wall covering of claim 1 wherein the separation means comprises a friable material covering the pressure sensitive adhesive composition, wherein said friable material crumbles into particles upon the application of pressure to the substrate, whereby the pressure sensitive adhesive composition is exposed to and contacts the wall.

18. The wall covering of claim 1 wherein the separation means comprises fiber flocking sufficient to keep the pressure sensitive adhesive composition from contacting the wall until increased pressure is applied to the front side of the substrate.

19. The wall covering of claim 1 wherein the separation means comprises a material with a corrugated surface on which has been coated the pressure sensitive adhesive composition in the areas which form the troughs of the corrugated surface.

20. The wall covering of claim 1 wherein the substrate is a first paper, the separation means is a second paper which is 0.75 to 2.5 mil thick, and wherein the second paper is adhered to the first paper by means of a pressure sensitive adhesive composition, and wherein said

second paper has a plurality of holes through which the pressure sensitive adhesive composition is available to contact a wall, whereby a repositionable wall covering is produced.

21. The wall covering of claim 1 wherein the substrate is a vinyl film, the separation means is a paper which is 0.75 to 2.5 mil thick, and wherein the separation means is adhered to the substrate by means of a pressure sensitive adhesive composition, and wherein said separation means has a plurality of holes through which the pressure sensitive adhesive composition is available to contact a wall.

22. A method of manufacturing a wall covering comprising the steps:

a) applying to a wall covering substrate a pressure sensitive adhesive composition;

b) before or after applying the pressure sensitive adhesive composition to the substrate, applying to the substrate a separation means able to allow the wall covering to be slidably moved initially along the surface of a wall in the presence if the pressure sensitive adhesive composition.

23. The method of claim 22 wherein the substrate is selected from the group consisting of natural or synthetic cloth, plastic, paper, and pressed cellulosic material.

24. The method of claim 22 wherein the pressure sensitive adhesive composition is selected from the group consisting of natural rubber, butyl rubber, polyisobutylene, nitrile, styrene-butadiene, polyurethane, polysulfide, polyesters, silicone, neoprene, and mixtures thereof.

25. The method of claim 22 wherein the pressure sensitive adhesive composition is selected from the group consisting of polyvinyl acetate, vinyl acetate, alkyl acrylates, acrylics, methacrylics and methyl methacrylates.

26. The method of claim 22 wherein the separation means has openings through which the pressure sensitive adhesive composition is exposed for subsequent contact with the wall.

27. The method of claim 22 wherein the separation means is selected from the group consisting of plastic film, paper, cloth, and synthetic fabric.

28. The method of claim 22, wherein the separation means comprises multiple compressible projections which protrude from said back side of the substrate and through the pressure sensitive adhesive composition.

29. The method of claim 28 wherein the projections comprise a deformable plastic foam.

30. The method of claim 29 wherein the deformable plastic foam is selected from the group consisting of urethanes, polyvinylidene chloride, polyethylene, polypropylene, polystyrene, rubber latices (natural and synthetic), and polyvinyl chloride.

31. The wall covering of claim 22 wherein the separation means comprises a powder selected from the group of materials consisting of talc, ground PVC, teflon, polyolefin, expandable PVDC spheres, silica, wax, titania, starch, glass beads and flour.

32. The method of claim 22 wherein the separation means comprises a friable material covering the pressure sensitive adhesive composition, wherein said friable material crumbles into particles upon the application of pressure to the substrate, whereby the pressure sensitive adhesive composition is exposed to and contacts the wall.

33. The method of claim 22 wherein the separation means comprises fiber flocking sufficient to keep the pressure sensitive adhesive composition from contacting the wall until increased pressure is applied to the front side of the substrate.

34. The method of claim 22 wherein the separation means comprises a material with a corrugated surface on which has been coated the pressure sensitive adhesive composition in the areas which form the troughs of the corrugated surface.

35. A method of applying wall covering to a wall comprising the steps:

a) obtain a self-adhesive wall covering product that is easily repositioned after initial contact with a wall, which product comprises a substrate having a decorative front side and a back side; a pressure sensitive adhesive composition coated onto said back side of said substrate; and a separation means secured to or a part of said substrate;

b) contact the separation means to the wall, wherein said separation means temporarily reduces the contact surface area between the adhesive composition and the wall;

c) reposition the wall covering by sliding it on the surface of the wall upon the contacting surface of the separation means without significantly contacting the adhesive composition with the wall until the desired location is attained;
d) exert force to the decorative front side of the substrate sufficient to contact the adhesive composition with the wall to thereby secure the wall covering to the wall.

36. The method of claim 35 wherein the substrate is selected from the group consisting of natural or synthetic cloth, plastic, paper, and pressed cellulosic material.

37. The method of claim 35 wherein the pressure sensitive adhesive composition is selected from the group consisting of natural rubber, butyl rubber, polyisobutylene, nitrile, styrene-butadiene, polyurethane, polysulfide, polyesters, silicone, neoprene, and mixtures thereof.

38. The method of claim 35 wherein the pressure sensitive adhesive composition is selected from the group consisting of polyvinyl acetate, vinyl acetate, alkyl acrylates, acrylics, methacrylics and methyl methacrylates.

39. The method of claim 35 wherein the separation means has openings through which the pressure sensitive adhesive composition is exposed for subsequent contact with the wall.

40. The method of claim 35 wherein the separation means is selected from the group consisting of plastic film, paper, cloth, and synthetic fabric.

41. The method of claim 35, wherein the separation means comprises multiple compressible projections which protrude from said back side of the substrate and through the pressure sensitive adhesive composition.

42. The method of claim 41 wherein the projections comprise a deformable plastic foam.

43. The method of claim 42 wherein the deformable plastic foam is selected from the group consisting of urethanes, polyvinylidene chloride, polyethylene, polypropylene, polystyrene, rubber latices (natural and synthetic), and polyvinyl chloride.

44. The wall covering of claim 35 wherein the separation means comprises a powder selected from the group of materials consisting of talc, ground PVC, teflon, polyolefin, expandable PVDC spheres, silica, wax, titania, starch, glass beads and flour.

45. The method of claim 35 wherein the separation means comprises a friable material covering the pressure sensitive adhesive composition, wherein said friable material crumbles into particles upon the application of pressure to the substrate, whereby the pressure sensitive adhesive composition is exposed to and contacts the wall.

46. The method of claim 35 wherein the separation means comprises fiber flocking sufficient to keep the pressure sensitive adhesive composition from contacting the wall until increased pressure is applied to the front side of the substrate.

47. The method of claim 35 wherein the separation means comprises a material with a corrugated surface on which has been coated the pressure sensitive adhesive composition in the areas which form the troughs of the corrugated surface.

48. The wall covering of claim 11 wherein the separation means comprises a net or web-like construction.

49. The method of claim 26 wherein the separation means comprises a net or web-like construction.

50. The method of claim 39 wherein the separation means comprises a net or web-like construction.

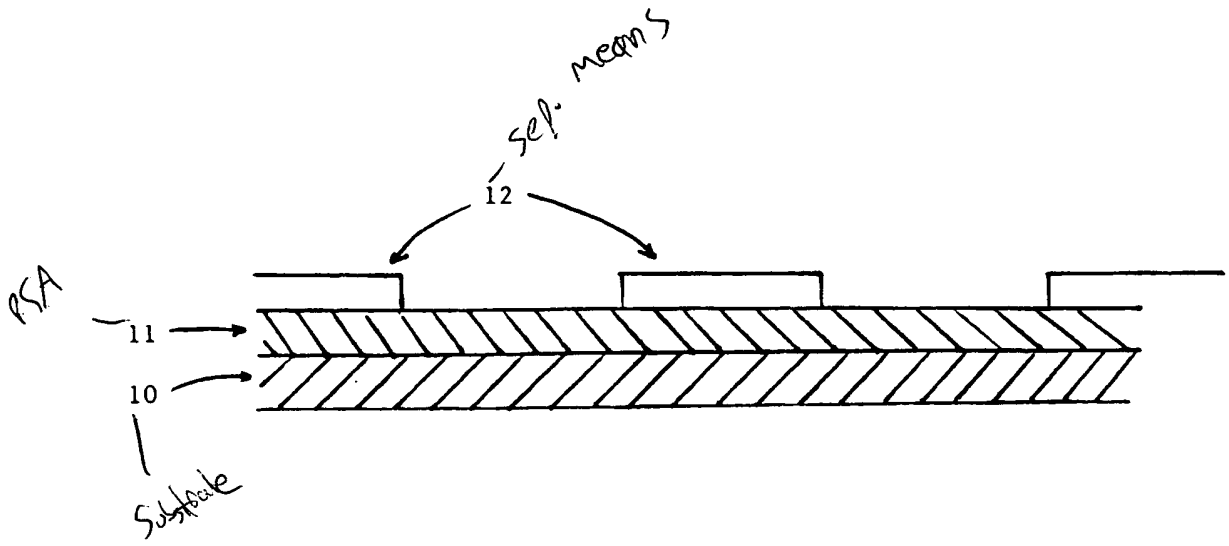

FIGURE 1

10 - printed substrate
11 - PSA
12 - separation means

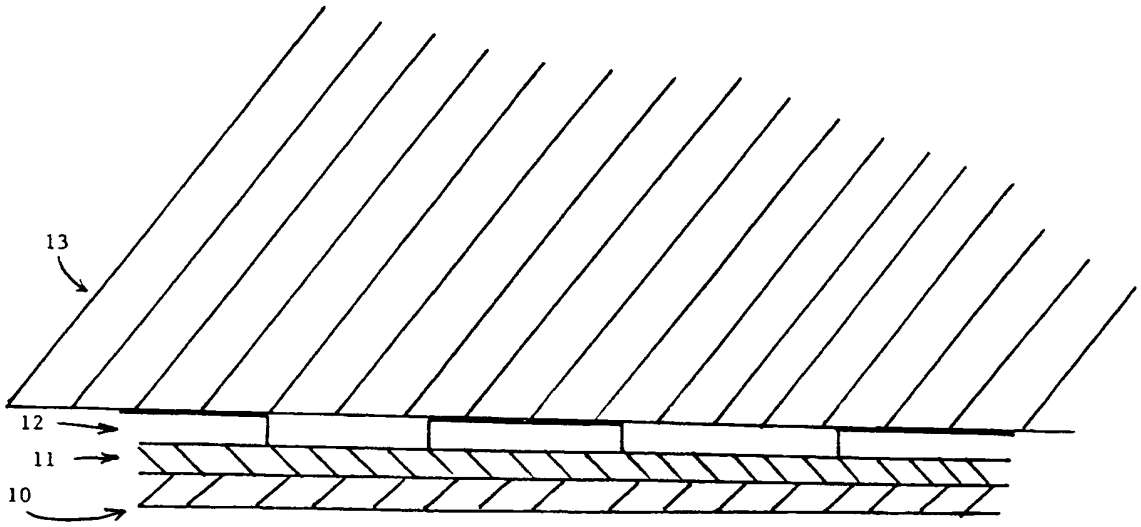

FIGURE 2

10 - printed substrate
11 - PSA
12 - separation means
13 - wall

Product of the invention in contact with the wall while still repositionable due to separation of the PSA from the wall.

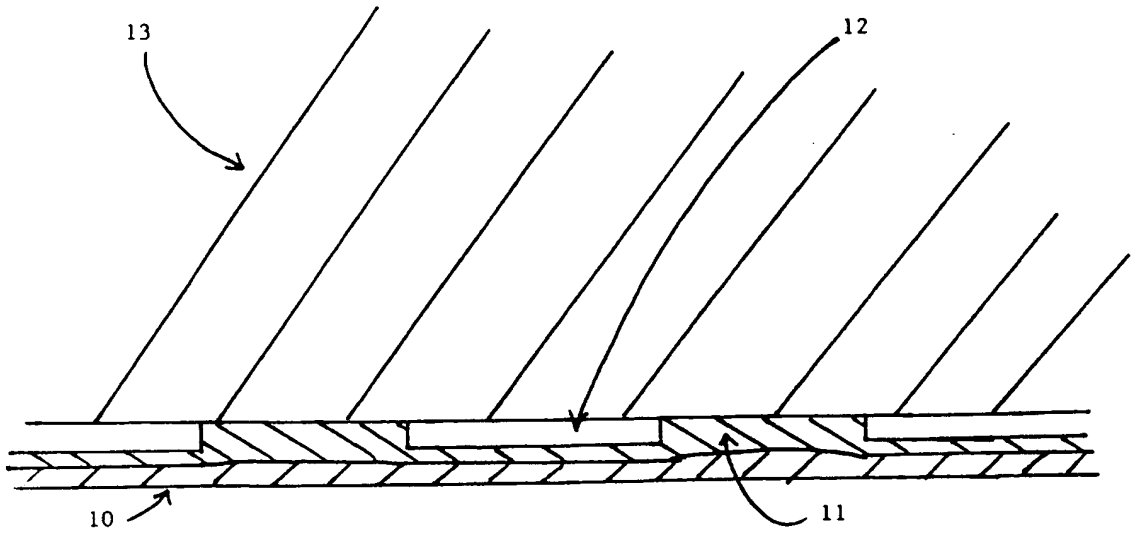

FIGURE 3

10 - printed substrate
11 - PSA
12 - separation means
13 - wall

Product of the invention after pressure is applied to the printed substrate sufficient to engage the PSA to the wall.

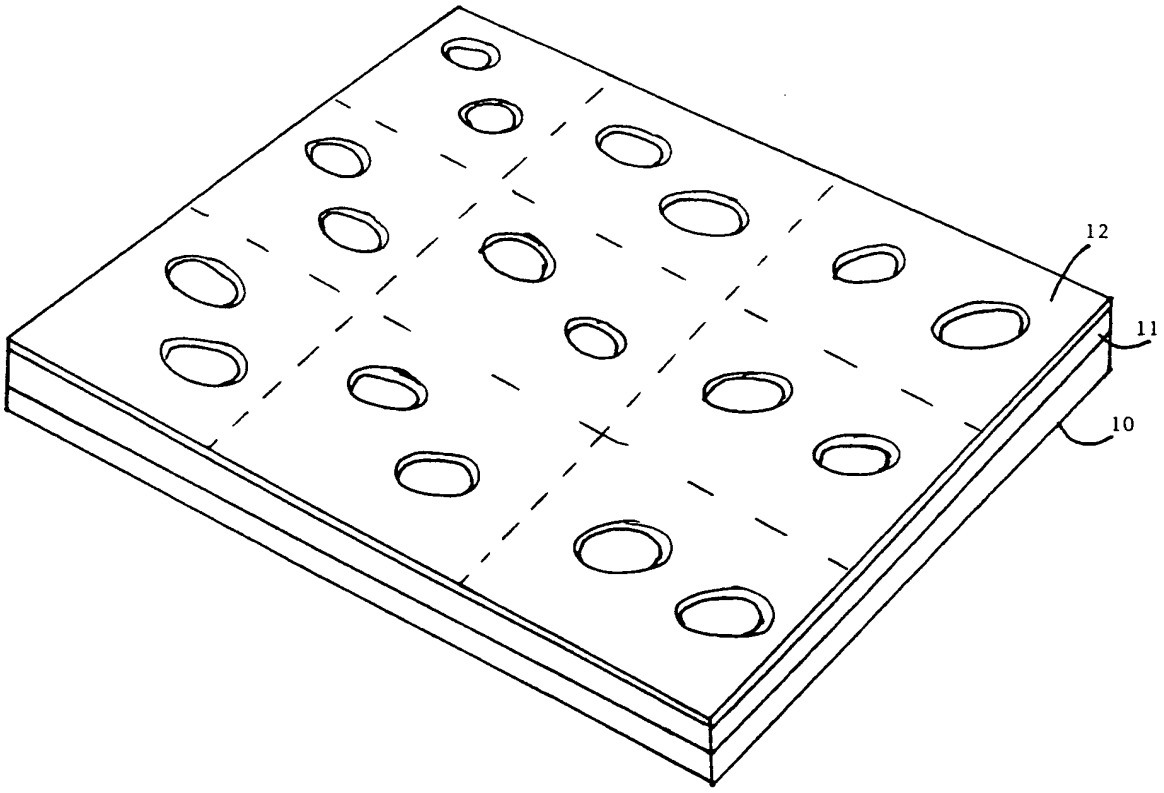

FIGURE 4

10 - printed substrate
11 - PSA
12 - separation means

A perspective view of one embodiment of the present invention wherein the separation means 12 is perforated to allow complete or partial removal of selected strips to achieve higher adhesion in the areas of the removed strips, and has holes to present the PSA beneath.

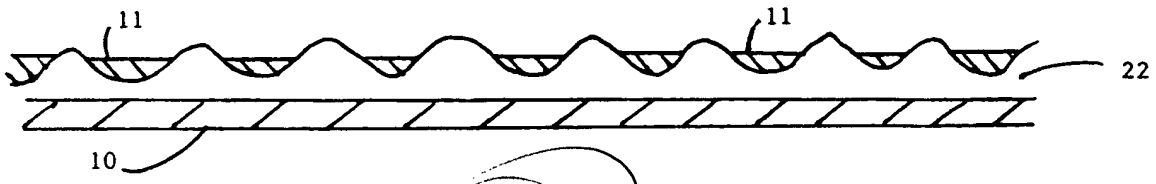

FIGURE 5

10 - printed substrate
11 - PSA
22 - separation means

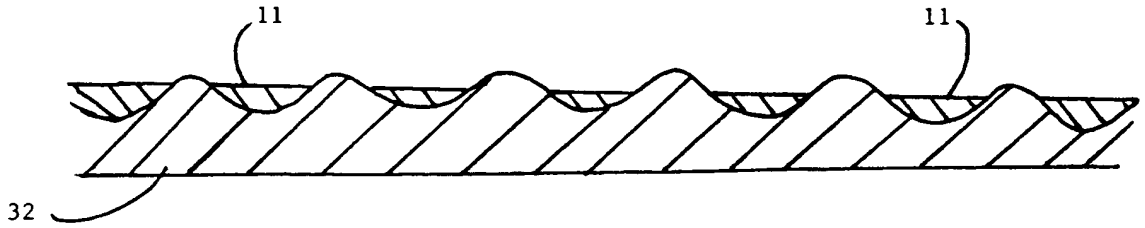

FIGURE 6

32 - combined printed substrate with rough backed separation means

11 - PSA

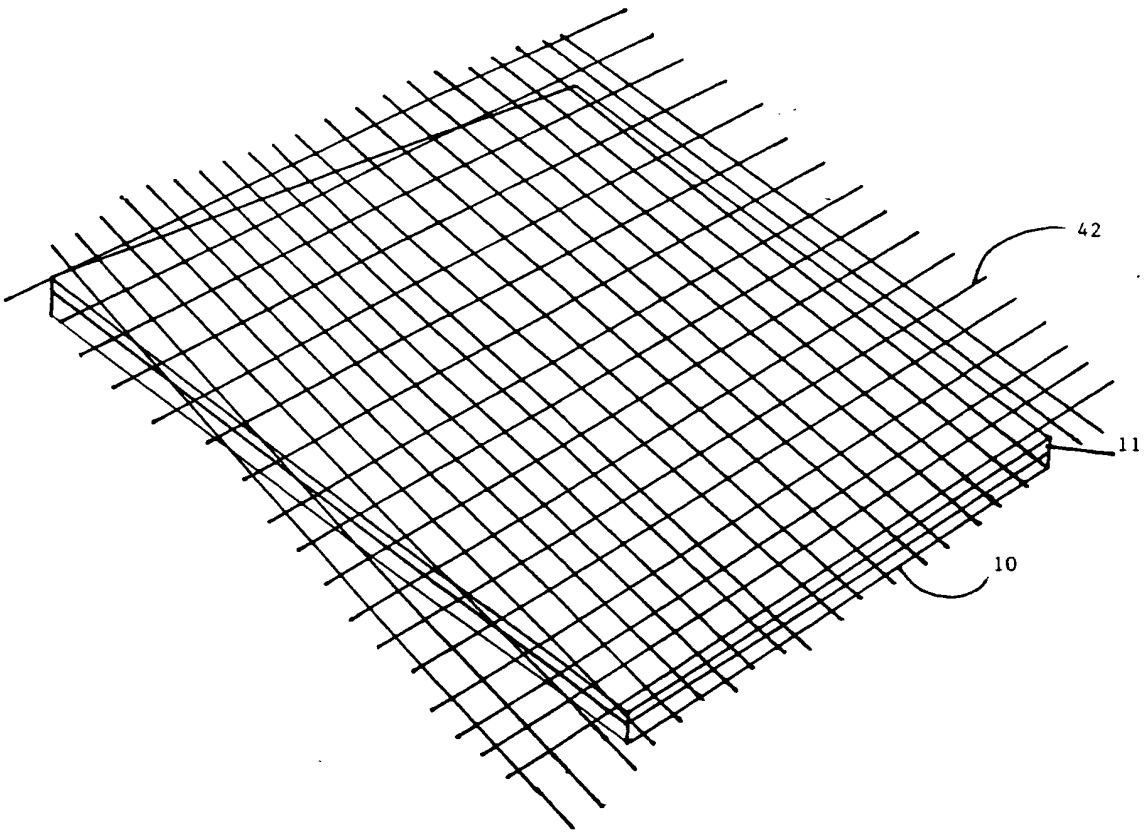

FIGURE 7

42 - net separation means
11 - PSA
10 - printed substrate

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 5163

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	WO-A-91 09725 (STEP LOC CORP)	1-4, 11-13, 22,23, 26-28, 35,36, 39-41, 48-50	D21H27/20 B44C5/04 D06N7/00 B32B5/00
Y	* the whole document *	5,9,10, 24,25, 37,38	
Y	SKEIST 'HANDBOOK OF ADHESIVES' 1977 , VAN NORSTRAND REINHOLD COMPANY , NEW YORK Chapter 47, C.W. BEMMELS : "Pressure-Sensitive Tapes and Labels" , pages 724-735 * page 726, column 2 - page 728, column 1 *	5,9,10, 24,25, 37,38	
A	WO-A-92 20534 (MINNESOTA MINING AND MANUFACTURING COMPANY) * page 13, line 10 - page 16, line 13 *	1-50	TECHNICAL FIELDS SEARCHED (Int.Cl.5) D21H B44C D06N C09J
A	EP-A-0 367 651 (O/Y KYRO A/B) * the whole document *	1-50	
A,D	PATENT ABSTRACTS OF JAPAN vol. 010, no. 303 (C-378)16 October 1986 & JP-A-61 115 981 (CHUGOKU TORYO KK) 3 June 1986 * abstract *	1-50	
A,D	US-A-3 663 269 (FISCHER ET AL.) * the whole document *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 April 1994	Songy, O

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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